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Proceedings of the regional peer review on the assessment of the Gulf of St. Lawrence Capelin stock (4RST)

February 27, 2018
Mont-Joli, Quebec

Chairperson: Martin Castonguay
Rapporteur: Sonia Dubé

Maurice Lamontagne Institute
Fisheries and Oceans Canada
850 Route de la Mer, P.O. Box 1000
Mont-Joli, Quebec G5H 3Z4

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Canada

Foreword

The purpose of these proceedings is to document the key activities and discussions that took place during the meeting. The proceedings may include research recommendations, uncertainties and the rationale for decisions made during the meeting. They may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. Therefore, interpretations and opinions presented in this report may be factually incorrect or misleading, but are included to record, as faithfully as possible, what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review of the issue may result in a change in conclusions, particularly if additional relevant information not available during the meeting is provided afterward. Finally, in rare cases where dissenting views are officially expressed, they are also documented in the appendices to the proceedings.

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SUMMARY

This document contains the proceeding from the meeting held within the regional assessment of the Gulf of St. Lawrence (4RST) Capelin stock. This review process was held on February 27th, 2018 at the Maurice Lamontagne Institute in Mont-Joli. This meeting gathered 35 participants from Science to Management. This proceeding contains the essential parts of the presentations and discussions held and relates the recommendations and conclusions that were presented during the review.

INTRODUCTION

The Quebec Region of Fisheries and Oceans Canada (DFO) is responsible for assessing several stocks of fish and invertebrate species harvested in the Estuary and Gulf of St. Lawrence. Most of these stocks are periodically assessed as part of a regional advisory process conducted at the Maurice Lamontagne Institute in Mont-Joli. This document consists of the proceedings of the meeting held on February 27, 2018, on the assessment of the Gulf of St. Lawrence (4RST) Capelin stocks.

The objective of the review was to determine whether there are any changes in the resource's status and whether management plans need to be adjusted based on the chosen conservation approach, the ultimate goal being to formulate a Science Advisory Report on the management of Capelin stock in the Gulf of St. Lawrence (4RST) for the 2018–2019 fishing seasons.

These proceedings report on the main points of the presentations and deliberations that arise from the regional stock assessment committee's activities. The regional review is a process open to all participants who are able to provide a critical outlook on the status of the assessed resources. Accordingly, participants from outside DFO are invited to take part in the committee's activities within the defined terms of reference for this review (Appendices 1 and 2). The proceedings also list the recommendations made by meeting participants.

CONTEXT

Meeting chairperson Martin Castonguay welcomes the participants. He goes over the peer review objectives and agenda. After the participants introduce themselves, the assessment biologist, Andrew Smith, begins his presentation by highlighting the contribution of his collaborators, including the considerable work done by Jean-Martin Chamberland. Mr. Smith outlines the meeting's agenda, the terms of reference, and briefly reviews the summary of the latest Science Advisory Report published in 2013 (2013/021) and the Science Response Report following an update produced in 2015 (2015/032).

Several elements of the capelin's ecology are discussed by the biologist (e.g. taxonomy, longevity of 4 to 6 years, maturity toward the age of 2 to 3 years). The distribution and reproductive success of the capelin are greatly influenced by the physical and biotic environment. The capelin's condition and spawning depend particularly on the emergence of zooplankton prey. The water temperature also plays an important role in the distribution of capelin.

With respect to predation, which accounts for up to 88% of capelin mortality, the level of predation based on research conducted in 2005 and in 2011-2014 remains substantially the same according to the period evaluated. Cod and turbot are now emerging as important predators, while harp seal predation has declined sharply, possibly in relation to the reduced presence of ice in the Gulf.

The global context of the commercial fishery is presented as is the situation on the east coast of Newfoundland and in the Estuary and Gulf of St.Lawrence (4RST).

Following this background, the participants have a few comments:

- The presence of ice in 2017 seems to have had a major impact on fishing yields.
- Participants try to explain the absence of redfish among the important capelin predators by the fact that these two species do not share the same habitat, with the redfish being on the bottom layer. There is also talk of cannibalism in redfish.

- We are also wondering about the extent of predation by birds.
- Globally, this resource was under pressure from fishing in the 1970s and the 1980s. It is noted that a closure of the fishery was imposed in 2017 in Iceland, following a decline in the biomass and in order to maintain the MSC certification.
- We are reminded that that capelin are exploited for the eggs.

ASSESSMENT OF THE RESOURCE

THE COMMERCIAL FISHERY IN DIVISIONS 4RST

Biologist Andrew Smith presents commercial landings by division, fishing gear, and unit area along with the fishery's spatial patterns. The year 2017 recorded the lowest landings (1,973 t) since 2001 (741 t), a sharp decline compared to 2016. Since 2001, the average annual landing in NAFO Divisions 4RST is 8,040 t. The TAC is currently 14,300 t. Most of the landings come from the purse seine fishery found on the west coast of Newfoundland (Division 4R). The "Tuck" seine fishery has also grown in the same region since 2005.

Since 2003, the fishing effort in Division 4R has shifted north along the west coast of Newfoundland to the Strait of Belle Isle, with the exception of 2017 where ice and bad weather limited fishing activities.

A few comments from the participants:

- With regards to landings in 2017, the participants agree that this is a bad year. We trust the data, even if it is preliminary.
- Poor weather conditions (e.g. strong winds) and the presence of ice may explain these low yields.
- It would be interesting to examine the low landings observed in the years 1995 and 2001.

FISHING PERFORMANCE INDEX

Jean-Martin Chamberland presents the CPUE standardization model used to obtain the performance index of the commercial purse seine and "Tuck" seine fishery in 4R. The performance index of the purse seine fishery has declined significantly since 2013, but remains above the time series average (1986-2017).

- Some participants believe that the decline in the performance index reflects the difficult conditions of 2017. However, we observe that this decrease follows the trend of previous years.
- It is noted that the periods of increase in the index appear to correspond to the transition years of the capelin to 4Ra, which may suggest mixing with individuals from the east coast of Newfoundland. However, no data currently validates this information.
- This indicator is more reflective of fleet performance than the abundance of the resource. Various factors associated with technical changes and management measures could explain increased performance in the second half of the 2000s.

SHRIMPERS' BY-CATCHES

In the shrimp fishery, capelin is a regular bycatch. In 2017, 65 t of capelin were caught and discarded. These catches are not counted in DFO official statistics.

BIOLOGICAL DATA

The biologist reviews the biological data, notably the sex-ratio, length frequencies, and the Fulton condition index. Since 2011, the condition of capelin caught in the commercial fishery has been declining, and values in 2016 and 2017 are among the lowest of the time series. Since 2015, the size of capelin measured in the commercial fishery has been declining in most NAFO areas of the Gulf.

- It is suggested to rigorously examine the origin of the samples for a more detailed analysis.
- The various biological indexes (length frequencies, Fulton indexes) and the performance index coincide.
- With respect to gonad mass, it is proposed to present this data as a gonadosomatic index.
- Some participants mention that the increase in the proportion of spawning individuals in recent years appears to be associated with later fishing. It is mentioned that a portion of these individuals may be from eastern Newfoundland, although no studies yet confirm this.

RELATIONSHIP BETWEEN PERFORMANCE INDEX AND ENVIRONMENTAL CONDITIONS

The relationship between the fishery performance index and the environmental conditions was examined in terms of the potential for a relative index of abundance/recruitment. Jean-Martin Chamberland presents the method used and the results obtained. These analyses suggest that capelin recruitment is related to environmental factors such as water temperature and the availability of zooplankton prey.

- The three environmental variables with the best fit are: the timing of the spring thaw, the maximum ice volume, and the biomass of *Calanus hyperboreus*.
- It is mentioned that colder years appear to be more conducive to recruitment.
- Including changes in management measures (i.e. allowed sharing between fishers) among the other assessed variables (biological, economic, technological) is suggested.
- As to whether the performance index could be used as a relative index of abundance/recruitment, some advice caution since several factors may be involved, even although this index is highly correlated to environmental variables that influence the abundance of capelin.
- It may be appropriate to perform the exercise by NAFO sub-division and for 4Sw.
- Once again, we are wondering about the current source of capelin, and what motivates the movement of fishers.
- It is agreed that this index has potential, but that several elements should be clarified first.

MULTIDISCIPLINARY SURVEYS

The biologist presents an index measuring the dispersal (and not the abundance) of the capelin during multidisciplinary bottom trawl surveys in the Gulf of St. Lawrence.

- The relevance of this index is questioned, especially because that the trawl survey targets groundfish.
- According to a detailed analysis of the dispersal index, the catchability of capelin was not constant, but biased by various factors that vary from one year to another: temperature, depth, time of capture, presence of cod. We consider the possibility of taking these effects

into consideration, but by correcting these effects, we no longer seem to be rather uncertain about what the index represents.

- Some participants believe that this index, by providing complementary information, is still useful.
- We therefore decide to keep this index in the research document, but not to include it in the Scientific Advisory Report.

CONCLUSION

FUTURE RESEARCH WORK

The following research work is underway:

- Acoustic mission and pre-spawning survey: toward an abundance index;
- Otolith readings to develop an age-length key specific to the GSL;
- DLMtools in R (Methods for limited data);
- Collaboration with the North Shore ZIP;
- Collaboration with DFO's Newfoundland Region to characterize the genetic differences between the populations and the various spawning patterns.

INTERIM YEAR

The next assessment is scheduled in two years, with no update until then.

HIGHLIGHTS AND RECOMMENDATIONS

The highlights are presented and the participants comment on them.

- In the first highlight on landings, it was agreed to add a sentence on the current TAC. We agree to stress the sharp drop in landings since 2016.
- In the highlight on the distribution of landings, we agree to make reference to the movement of the fishery northward along the west coast of Newfoundland to the Strait of Belle Isle, with the exception of 2017 where ice and bad weather have limited fishing activities.
- Regarding the highlight about the performance index in relation to environmental conditions, we need only mention that analyses suggest that recruitment is linked to environmental variables.
- It was decided to remove the bycatch and dispersion index highlights. This last element will have to be addressed and included in the section of the Advisory Report on sources of uncertainty.
- We rework the highlight on the length and condition of the capelin by writing a fact for each. Emphasis is placed on the low condition index values in 2016 and 2017.
- As for the recommendation, the local depletion risk must be questioned. Given the uncertainty, we will not discuss the need to disperse the effort. The assembly agrees to recommend an significant decrease in the TAC as a precautionary measure. This Advisory Report concerns the 2018 and 2019 fishing seasons.

As such, the recommendation of the assembly is as follows:

Due to the decline in the fishery performance index, the decrease in the biological indices, the very low landings in 2017, and the predominant role of capelin in the ecosystem as a forage species, a significant decrease in the total authorized catch for 2018 and 2019 is advised as a precautionary measure.

APPENDIX 1- LIST OF PARTICIPANTS

Name	Affiliation
Bernier, Denis	DFO Science
Boudreau, Mélanie	DFO Science
Bourdages, Hugo	DFO Science
Brassard, Claude	DFO Science
Brosset, Pablo	DFO Science
Castonguay, Martin	DFO Science
Chamberland, Jean-Martin	DFO Science
Chouinard, Pierre-Marc	DFO Science
Couillerot, Brieuc	ZIP Côte-Nord du Golfe
Corriveau, Julie	DFO Science
Cyr, Charley	DFO Science
Desgagnés, Mathieu	DFO Science
Duplisea, Daniel	DFO Science
Dubé, Sonia	DFO Science
Dunne, Erin	DFO Fisheries Management
Ellefsen, Hans Frederic	DFO Science
Gagnon, Félix	ZIP Côte-Nord du Golfe
Gauthier, Johanne	DFO Science
Geoffroy, Maxime	Memorial Universityl, Newfoundland and Labrador
Girard, Linda	DFO Science
Hawkins, Laurie	DFO Fisheries Management
Hurtubise, Sylvain	DFO Science
Massé-Beaulne, Valérie	DFO Science
McQuinn, Ian	DFO Science
Morneau, Renée	DFO Science
Nilo, Pedro	DFO Science
Nozères, Claude	DFO Science
Paquet, Frédéric	DFO Science
Parent, Shannie	DFO Science
Plourde, Stéphane	DFO Science
Sainte-Marie, Bernard	DFO Science
Smith, Andrew	DFO Science
Tessier-Bolduc, Claudie	DFO Science
Vanier, Caroline	DFO Science
Van Beveren, Elisabeth	DFO Science

APPENDIX 2- TERMS OF REFERENCE

Assessment of Gulf of St. Lawrence capelin stock (4RST)

Regional Peer Review - Quebec Region

February 27, 2018
Mont-Joli, QC

Chairperson: Martin Castonguay

Context

In the Estuary and Gulf of St. Lawrence, capelin has traditionally been used as fertilizer, bait or for its oil. Towards the end of the 1970s, the emergence of a Japanese market for roe-bearing females sparked a rapid growth of the fishery with catches that increased from approximately 700 t per year to nearly 10,000 t. In NAFO Divisions 4RST, most catches are made on the west coast of Newfoundland by a fleet of small and large purse seiners and by trap fishermen. Capelin is also caught on Quebec's Lower North Shore and weirs in the St. Lawrence Estuary. In addition to recreational catches made on beaches during the spawning season, capelin are also a by-catch of the shrimp (Pandalus borealis) fishery and the groundfish and shrimp multidisciplinary surveys conducted annually in the Estuary and northern and southern Gulf of St. Lawrence.

Even though capelin population structures in the Estuary and Gulf of St. Lawrence are not clearly defined, the species is managed according to two distinct management units, NAFO Divisions 4R and 4ST. A Total Allowable Catch (TAC) of 11,195 t is applied to Division 4R compared with 1,805 t for all of Divisions 4ST. There is no abundance survey specifically directed on capelin. Consequently, it is impossible to calculate spawning biomass, fishing mortality and limit reference points, which would help define, based on the precautionary approach, a strategic framework for the fishery and a TAC.

The last capelin assessment in Divisions 4RST was conducted in 2013. An update of the stock status was produced in 2015. The Fisheries Management Branch requested science advice on this stock for the 2018 and 2019 fishing seasons.

Objectives

Provide scientific advice on the capelin stock status in the Gulf of St. Lawrence (Divisions 4RST) for the 2018 and 2019 fishing seasons. This review will include:

An assessment of the distribution of capelin based on:

- An analysis of the commercial fishery statistics (overall distribution of landings and breakdown by division, unit area, month and fishing gear);
- An analysis of the biological data collected by port samplers and by at sea observers (size structure and some biological parameters);
- Calculation of the capelin by-catches by NAFO unit area in the Gulf of St. Lawrence shrimp fishery;
- Calculation of a new 4R seiner performance index;
- Data from the CCGS Teleost multispecies survey from the North and South of the Gulf of St. Lawrence (capelin occurrence as a function of its main predators and environmental factors);
- Critical evaluation of the 4R purse seiner performance index and the 4RST dispersion index calculated from the CCGS Teleost research surveys;

- The identification and prioritization of research projects to be considered for the future.
- The determination of the process to provide advice during the interim years, including a description of conditions that may warrant a full stock assessment earlier than originally planned;
- Recommendations on acceptable harvest levels for the 2018 and 2019 seasons.

Expected Publications

- A Canadian Science Advisory Secretariat (CSAS) Science Advisory Report on capelin (4RST).
- CSAS Proceedings summarizing the discussions.
- CSAS Research Document.

Participation

- Fisheries and Oceans Canada (DFO) Science and Fisheries Management Branches
- Fishing industry
- Provincial representatives
- Aboriginal communities/organizations